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Perkins, George C.

The Isthmian Canal

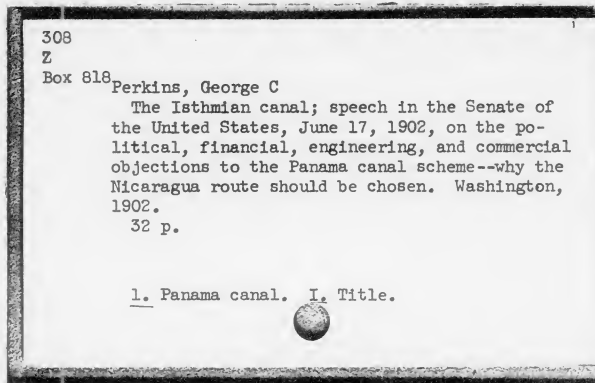
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THE ISTHMIAN CANAL.

SPEECH

OF

GEO. C. PERKINS,
OF CALIFORNIA,

IN THE

SENATE OF THE UNITED STATES,

JUNE 17, 1902,

ON THE POLITICAL, FINANCIAL, ENGINEERING, AND COMMERCIAL
OBJECTIONS TO THE PANAMA CANAL SCHEME—WHY
THE NICARAGUA ROUTE SHOULD BE CHOSEN.

WASHINGTON.
1902.

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An Inter-Oceanic Canal.
REMARKS
OF
HON. GEO. C. PERKINS,
OF CALIFORNIA,
IN THE SENATE OF THE UNITED STATES,
Tuesday, June 17, 1902.

The Senate, as in Committee of the Whole, having under consideration the bill (H. R. 3110) to provide for the construction of a canal connecting the waters of the Atlantic and Pacific oceans—

Mr. PERKINS said:

Mr. PRESIDENT: The Pacific coast States are especially interested in the construction of an isthmian canal that will connect the waters of the Pacific with those of the Atlantic. For thirty years or more this subject has been uppermost in the minds of the people of the Pacific coast States. They believe the construction of such a canal would place our people and the products of our lands more easily in the markets of the world, thus saving a voyage around Cape Horn of 15,000 miles or a journey across the continent.

The consensus of opinion, I think, has been in favor of the Nicaragua canal. The concessions that have been made by the Nicaraguan Government have been liberal and generous. Those of the Costa Rican Government I never heard questioned until yesterday, when the distinguished Senator from South Dakota (Mr. KITTREDGE) advanced, to my mind, the first view that under the constitution of the Republic of Costa Rica they were prohibited from making a concession for building a canal through their territory. If that is true, Mr. President, the legal minds of our country have been laboring under an erroneous impression. But be that as it may, the remarks that I propose to make this morning are intended to show the advantages, as I understand them, of the Nicaraguan route over that of any other route that is known. It possibly will be shown that the San Blas or Darien route or the Tehuantepec route or some other route has peculiar natural advantages over any other route when there is a probability of a law being enacted that will enable this Government to acquire jurisdiction to construct a canal.

FEW ADVANTAGES IN THE COLOMBIAN TREATY.

If, as the Senator from South Dakota has stated, the constitution of Nicaragua does not give that country a right to make this concession to the United States, certainly the memorandum of the convention that is proposed between the United States and Colombia, which has been sent to Congress by the Secretary of State, does not give us many advantages in Colombia. While the Senator was delivering his very able speech yesterday I took occasion to look over this protocol or draft of a convention which it is proposed to enter into between these Governments. That between the United States and Nicaragua is clear and forcible;

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there is no ambiguity in it; it is concise and to the point. It says the Republic of Nicaragua leases in perpetuity for all time to the United States the exclusive right to construct, own, and operate a ship canal through the territory of Nicaragua to connect the Atlantic and Pacific oceans. There are no strings tied to that provision. It is clear and concise and to the point. The provision follows that we are to pay a certain sum of money per annum for this privilege for a certain length of time.

What does this suggested treaty with Colombia propose to do? I looked at it yesterday while the distinguished Senator was making his speech. I view it only as a business man. I venture to say if the Senator were my counsel seeking a franchise in my State for the right to build a turnpike road or to construct a ferry or bridge across a river upon which I might collect the tolls, he would say, "You can not accept any such proposition as there is in this memorandum."

SOME OF THE DISADVANTAGES.

What does it do, Mr. President? It goes on, first, to provide that Colombia shall cease to receive \$250,000 per annum for the privileges which we are to inherit of the Panama Railroad Company. It goes on further to state that we shall pay \$7,000,000. The conditions under which we shall make the payment are clear; there is not any ambiguity in it, but when it comes to fixing the rates for the privilege of a canal through the State of Colombia it is quite a different story.

It impresses me as a business man, as I gave it a cursory reading yesterday, that there is not a lawyer in the Senate who would advise one to accept a franchise and spend any money under the privilege of that franchise, thinking he had something from a county or State that was of value, because there is no limit for the rate of payment. It simply provides that three years before the expiration of the fourteen years they shall fix a reasonable annuity, and there shall be taken into consideration the present price of the usufruct of the railway, as well as the compensation that is to be stipulated for the use of the zones for the additional administrative expenses that the construction of the canal will impose upon Colombia, and also the advance payment of \$7,000,000 and the comparative cost and conditions upon which the United States reasonably would be expected to acquire concessions satisfactory to it in respect of any other canal.

But how does it fix those rates, Mr. President? It goes on to provide that there shall be two representatives from the State of Colombia, two representatives from the United States, and if they can not agree, which of course they would not, then the fifth arbitrator is called in, and it is provided that—

The president of such high commission shall be the president, for the time being, of the International Peace Tribunal of The Hague, and the determination reached by said commission, by a majority vote, concerning such fair and reasonable annuity that is to be paid to Colombia by the United States in conformity with this article, shall be binding upon the contracting parties.

THE HAND OF THE FOREIGNER.

That virtually places the fixing of the rate of compensation per annum that the United States shall pay for its canal, the right of operating it through the State of Colombia, if we acquire the Panama route, at the rental the president of The Hague Peace Conference shall name. He lives 3,000 miles or more away from the United States; he has no common interest with us; and yet

by memorandum of the treaty that is to be made he virtually fixes the rate. He can confiscate that railroad or canal and all that we have expended there, and we have no rights whatever in it according to the memorandum of this convention.

If these rates are not satisfactorily adjusted, then Article XXVI provides that—

all the concessions granted by this convention shall be forfeited, and all the works, principal and accessory, machinery, and properties of the canal shall become the property of the Republic of Colombia and the same Republic shall recover its actual rights over the Panama Railway without any obligation to return any of the sums that it may have received in conformity with this convention.

In any ordinary franchise there is a provision made that the rates of toll shall not be less than to pay a certain sum per annum upon the investment therein made. There is no such limitation here. The rate fixed can be whatever the president of The Hague Peace Conference may name, and we are virtually in his power. As I said, it may result in a confiscation of the property.

I was surprised when I gave a cursory reading to this document yesterday to see that the interests of the United States were in no way protected by this proposed treaty, and I can not, therefore, as a business proposition, seriously consider such a measure. I would not as an individual or as one representing a private company or corporation, and surely as one of the representatives in part of a great State I can not cast my vote in favor of a measure that leaves every dollar invested by the United States there virtually in the hands of the president of The Hague Peace Tribunal, which might amount, as I said before, to a virtual confiscation of every dollar we put in the property.

PANAMA ENTAILS POLITICAL AND FINANCIAL DIFFICULTIES.

But, Mr. President, some canal we are all in favor of. There is no doubt as to the necessity of an isthmian canal or as to who shall build it. It is to be built, and built only by the United States. The only question remaining to be solved is that relating to the route to be selected. We have hitherto looked only to the route across Nicaragua; but now, unfortunately, that route which all of us formerly looked upon with more than doubt has been brought forward as an alternative, and we are compelled to make choice between Nicaragua and Panama. At first glance it will appear to many, doubtless, that there is not much difference in availability, but I think that a careful study of the problems presented by the Panama scheme which has been proposed by the Isthmian Commission will result in a decision in favor of the Nicaragua route.

In my opinion, to take hold of the Panama scheme, which has had as its principal characteristic from the beginning fraud of the most gigantic kind, will involve this country in political and financial troubles that may be far-reaching and disastrous. We are asked to give to the French canal company \$40,000,000 for a 50-mile railroad, old machinery, and plans, and for the right to utilize the excavations which it has made at a cost to the French people of about \$260,000,000 in cash.

It will be noted that the sale of the property and assets of the old company to the new was upon the express condition that the property and rights thus transferred should revert to the estate of the old company in liquidation upon default in the completion of the canal within the time fixed in the concession. It will also be noted that the old company has a claim upon the

new of 60 per cent of the surplus income after paying all expenses, charges, and stipulated dividends, the sum thus paid to be properly distributed by the liquidator. It will still further be noted that this agreement, according to the statement of the New Panama Canal Company, in Senate Document No. 188, Fifty-sixth Congress, first session, page 31, was by private contract.

FRENCH PEOPLE HAVE AN INTEREST IN PANAMA.

The persistency with which M. Hutin, president of the New Panama Canal Company, pressed on the Isthmian Commission a claim to a share in the profits of the canal after completion would seem to have in view this obligation. It was only at the last moment that it was dropped.

We could, I believe—

Wrote M. Hutin to Admiral Walker—

continue to maintain that our claim is just and well founded.

But he finally announced that—

we are now prepared to relinquish totally our claim to a share in the eventual profits of the management of the canal, having in mind that this surrender constitutes on our part an act of conciliation, which must be taken into account during the discussion of our other propositions.

This claim of a share of the profits, as well as the provision for the return to the old company of its property and assets, in case the canal was not completed in accordance with the concessions, is in the interests of the stockholders of the old company, who number 600,000 or 700,000 French citizens.

Mr. MITCHELL. Eight hundred thousand.

Mr. PERKINS. I am on the conservative side, and I shall endeavor to be so in all the statements I make.

Mr. MITCHELL. I will say to the Senator that the figure I state is the testimony of the representative.

Mr. PERKINS. The value of the property, assets, etc., can be returned to them through the purchase money given for them by the United States, so their interests are protected as to that, but the price of their consent to this transfer of property to the new company was the 60 per cent interest in the canal earnings, from which they were to partially recoup themselves for the losses they had sustained. I think it may be questioned whether a private contract thus entered into for the benefit of half a million or more Frenchmen can be abrogated by the president of the new canal company. Through this agreement the stockholders of the old company are given an interest in the profits of the completed canal. It is part of the assets of the old company and, it would seem to me, can not be transferred to the United States without furnishing good ground for an action to recover. If such ground exists, it is not improbable that the French Government would be able, by championing the rights of so many of its citizens, to very greatly embarrass the United States in the prosecution of the work of building the canal, even if it did not ultimately enforce its claim of an interest in the undertaking.

LOSS THROUGH THE PANAMA RAILROAD.

The United States must purchase the stock of the Panama Railroad Company, which will require the expenditure of \$7,000,000. All of it must be bought or the United States will have partners in the canal enterprise. At present the new canal company holds all but 1,100 shares, these latter being owned in this country and in Europe. Whether they can be secured by the United States

at a reasonable figure is very doubtful. The owners hold the key to a very important position, and will not, it is likely, yield it for a payment of a mere par value. What they would exact from such a rich interested party as the United States can only be conjectured. If they offered to sell, it is sure that they would demand a large sum—far greater than the United States would pay. As it would not be policy to begin work until the shares were secured, negotiations to that end would be continued indefinitely, to the corresponding delay of construction.

Supposing, however, that the United States secured all the shares at par. Their cost would be \$7,000,000, but with them it would also assume obligations as follows: Mortgage bonds, bearing 4 1/2 per cent interest, \$2,504,000; sinking-fund subsidy bonds issued to the Colombian Government, bearing 6 per cent interest, \$996,000. Total, \$3,500,000, less cash assets, \$438,969.33, held January 15, 1902. Supposing the incredible, that these assets should remain practically at that figure when the canal is purchased by the United States, the latter will be under obligations of nominally \$3,000,000. But it will be noted that the bonds bear a very high rate of interest—higher than the holders can obtain in other investments. They will not, therefore, sell at par. They will demand more. They will undoubtedly deem that, to secure the interest they are now receiving, they must receive as much as, at 3 per cent, will bring them this sum. The sinking-fund subsidy bonds, therefore, will be held for \$1,992,000 and the mortgage bonds at \$3,756,000. This will make the total indebtedness \$5,748,000, bringing up the cost of the Panama Railroad to the United States to \$12,748,000. But there must be a diversion of this railroad, which the Commission estimates will require the expenditure of \$1,267,500. The Panama Railroad, therefore, would actually cost the United States \$14,015,500.

WHERE \$15,000,000 WILL GO.

But the Commission says that the earnings of the railroad during the construction of the canal will be so great that its indebtedness can be easily paid. It is of interest to know, however, who would pay these increased earnings. The increased work, outside of hauling food and clothing for laborers employed, would be that incident to the construction of the canal, and of course the United States would be the one from whom the charges would be collected. If the earnings of the road, which belong to the indebtedness, it is clear that this indebtedness is paid by our Government. The Commission's assumption, therefore, that the debts of the road will not have to be paid by the United States is without foundation. The Government must stand ready to pay the whole sum represented by the bonds.

But, says the Commission, "After the completion of the canal its commercial profits will probably cease, but it will have a value incidental to operating the canal." That value can not be more than the cost of constructing 50 miles of railroad, which, at the very liberal estimates of \$40,000 per mile, will amount to \$2,000,000. All the rest of the expenditures on account of the road will be a total loss to the United States, and this loss will aggregate nearly \$12,000,000.

But, assuming for the sake of argument, that there will be no financial or political complications by purchasing the French ex-

cavations, the question remains, Is the Panama route preferable to or even as good as that through Nicaragua? It seems to me that there is good evidence that the Panama route is far from the best. The questions presented have been studied by United States engineers and naval officers, and convincing arguments against Panama have been made.

COMPARISON OF THE TWO ROUTES.

In his report of the problems relating to interoceanic communication by way of the American Isthmus, made by Lieut. John T. Sullivan, U. S. N., in 1883, in response to a resolution adopted by the Senate of the United States, adopted at a time, I think, when ex-Senator Chandler was Secretary of the Navy, he reports the following disadvantages of the Panama route. This is not what I say, but what a distinguished naval officer reported to our Government:

- (1) The prevailing calms of Panama Bay.
- (2) Want of materials for the purposes of construction.
- (3) The large annual rainfall.
- (4) Character of some of the swamp lands on certain portions of the line.
- (5) A doubt as to the sufficiency of the water supply at all times.
- (6) The unhealthfulness of the country.
- (7) Greatly increased cost by the necessity for purchasing at a high figure the right of way from the Panama Railroad Company.

Against these disadvantages are placed the advantages of the Nicaragua Canal, as follows:

- (1) It is in a favorable geographical position, being in the region of the trade winds, and is especially favorable to the United States.
- (2) A canal constructed here will cost less than half as much as by any other route.
- (3) It passes through a country rich in resources and already sufficiently developed to sustain the construction force. There is an abundance of good stone, but it is not suitable for dimension stone. It will answer very well for concrete. There is plenty of limestone, and the kilns now in operation produce an excellent quality of lime suitable for hydraulic works. Bamboo, which would be useful in the works connected with the restoration of Greytown Harbor, can also be obtained in the country.
- (4) It offers no engineering difficulties that are not easy of solution at a moderate expense. The difficulties to be encountered are such as are met with and overcome in all engineering works of this kind.
- (5) It is a fresh-water canal, and will perform an important office in cleaning the bottoms and boilers of vessels passing through the canal.
- (6) It offers splendid facilities for docks and repairs on Lake Nicaragua, and it is not improbable that Patterson's grand scheme of establishing a distributing center for the commerce of the world may find its realization on the shores of Lake Nicaragua.
- (7) All materials needed for the construction of the canal are close at hand.
- (8) All plant can be conveyed by water communication already established and for which no royalty is to be paid. Between the lake and the Pacific several passable roads exist, and whatever other roads might be required over this short distance can be readily made at inconsiderable cost.
- (9) The mean annual rainfall is comparatively small.
- (10) The important physical feature of the route is the existence of Lake Nicaragua. It is not only capable of supplying twenty times the volume of water which the commerce of the world would require in the lockage of vessels, but receiving the drainage of 10,000 square miles of country, distributes the flood waters of that area over its superficies of 2,800 square miles, and thus relieves the San Juan Valley from extensive floods.

THE PANAMA ROUTE CAN NOT BE USED BY SAILING VESSELS.

These are some of the economic advantages of the Nicaragua Canal, as set forth by an impartial officer of the United States Navy. From a strictly maritime point of view, the advantages of Nicaragua are made equally plain.

Lieut. Frederick Collins, U. S. N., made, in 1880, before the Select Committee of the House of Representatives on the Oceanic Canal, the following statement relative to the winds and their relation to sailing vessels to and from the termini of the proposed Nicaragua and Panama canals:

No less person than Lieutenant Maury, "the father of the Physical Geography of the Sea," is said to have proclaimed that even if the Isthmus of Panama were to be divided by a convulsion of nature, it could never become a highway for sailing vessels on account of these unfavorable winds, calms, and currents.

It is certainly true that the prevailing meteorological conditions and oceanic currents in the vicinity of the west coast of the Isthmus of Panama are exceedingly unfavorable for either the approach or departure of sailing vessels.

In 1852 I had occasion, under directions from the Bureau of Navigation, to make a close examination of this subject, the results of which were published in Commander Selfridge's report of his surveys on the Isthmus. As a result of these investigations I was led to conclude that, comparatively speaking, no great difficulty need be experienced in getting from the vicinity of the Bay of Panama to a place where good winds might be found. A considerable detour from the most direct route would be necessary in most cases, it is true, but a careful computation gave only ten days as the average time that would be consumed in getting a sufficient offing to secure good winds, provided the correct route was pursued.

Now, ten days can hardly be considered a sufficiently formidable loss of time to preclude the use of the Isthmus route by sailing vessels, were it open. Indeed, in comparison of the time that would be saved on most voyages, ten days are a bagatelle. But if ten days can be saved by one Isthmus route that must be lost by another, then it becomes a matter of vital interest. And if in the comparison of two routes it can be demonstrated that one of them will bring our east and west coasts nearer by ten days than another, it appears to me that this fact alone would be sufficient to decide us in our choice.

I propose now to demonstrate beyond the possibility of denial, by a consideration of the winds and currents of the Pacific Ocean, that the Nicaragua route will give even a greater gain than that as compared with Panama or any route south of Panama on a voyage from New York or New Orleans to San Francisco.

LIEUTENANT MAURY'S SAILING DIRECTIONS.

Lieutenant Maury made an extensive examination of the subject and found that, in leaving the Bay of Panama for the North Pacific coast, a sailing ship must either proceed directly west, if the most favorable wind is found, but usually must shape her course south and make her westing south of the equator. In his sailing directions he says:

If he can get west here with a good breeze, he should crack on, and when his good wind fails him steer south again. * * * Therefore, in coming out of the Bay of Panama, and after crossing north in any season, make a southwest course if the wind will allow. If the wind be southwest, brace up on the starboard tack; if he be south-southwest, stand west if it be a good working breeze. But if it be light and blowing with rain, know that he is in the doldrums, and the quickest way to get clear of them is by making all you can on a due south course.

DIFFERENCE IN TIME IN FAVOR OF NICARAGUA.

Lieutenant Collins then explained to the committee the courses that must be taken by sailing vessels from the western termini of the Panama and Nicaragua canals to reach San Francisco. Comparing the distances and times, the result as given by him is as follows:

	Miles.	Days.
Panama to San Francisco.....	5,300	37
Nicaragua to San Francisco.....	3,260	25
Difference in favor of Nicaragua.....	2,110	14

On the return the difference in favor of Nicaragua is not so marked, but varies from five to six days. Lieutenant Collins then says:

The foregoing figures speak for themselves. They show that a canal at Nicaragua will bring New York or New Orleans nearer to San Francisco by nineteen days than will a canal at Panama or any of the proposed routes south of Panama. What other argument can be necessary to show the direction in which American interest lies?

A comparison of routes to other parts of the Pacific, while perhaps of less importance, is so interesting that I will ask your patience while I state briefly the results, without going into details.

To China, Manila, or Japan the difference in favor of the route from Nicaragua over that from Panama is 80 miles and five to six days.

To the Sandwich Islands the difference in favor of Nicaragua is 1,100 miles and seven to eight days.

To India, Batavia, Australia, and New Zealand the difference in favor of Nicaragua is 400 miles and two to three days.

Returning from China, Manila, Japan, or the Sandwich Islands the difference in favor of Nicaragua is 600 miles and four to five days.

Coming now, to a comparison of routes to ports on the west coast of South America, we might naturally suppose that here the Nicaraguan route would be at a marked disadvantage as compared with Panama; but, curiously enough, such is not the case. A comparison shows that even to Valparaiso or Callao there is a difference of 300 miles and one to two days in favor of the route from Nicaragua over that from Panama. On the return from these places we find the sole instance in which the route to or from Nicaragua appears at a disadvantage, the difference being about 500 miles and four days, this time in favor of Panama.

All the foregoing distances are given in nautical miles, which contain 6,080 feet each, while the ordinary or statute mile contains but 5,280.

The foregoing results have reference to sailing ships, and the saving for steamers will not be nearly as large, amounting, in fact, only to the direct distance between the two Pacific termini. This is about 660 miles, and as it would be gained both ways, it would amount in the round trip to San Francisco to a saving of 1,300 miles, which in a 10-knot steamer would be a matter of five days.

AN EMPHATIC STATEMENT.

In a letter to Captain Pim, royal navy, Lieutenant Maury has this to say as to the comparative merits of the Panama and Nicaragua canals, still quoting Lieutenant Collins:

"The great importance of one or more good commercial highways across Central America being admitted, the whole question of route resolves itself pretty much into a question of cost of construction and facility of ingress and egress by sea to and from the opposite termini; the latter is an affair of winds and currents, and their influence is powerful. Panama has the advantage of land transit; Nicaragua has the advantage in winds, terminal ports, and climate. The first is obvious, but to place the latter in a clear light some little explanation is necessary. * * * I have spoken of the calm belt about the equator. Panama is within its range, and is difficult to convey to any one who has never experienced these calms an idea of the obstinacy with which they vex navigation. We are all familiar with calms at sea which last for a few hours, or even a day, but here they last for days and weeks at a time. I have known vessels going to or from Panama to be detained by them for months at a time. * * *

On one occasion the British Admiralty, wishing to send one of their vessels into the Arctic Ocean from Panama in time to save the season, had her towed by a steamer through this calm belt and carried 700 miles out to sea before she could find a breeze.

"These remarks apply to the approach and departure by sea to or from the Pacific termini of any route across the Isthmus of Panama or Darien, and even with greater force to the Atlantic and others on the South American side of Panama. In short, the result of my investigations into the winds and currents of the sea, and their influence upon the routes of commerce, authorize the opinion which I have expressed before and which I repeat, namely: If nature, by one of her convulsions, should rend the Continent of America in twain and make a channel across the Isthmus of Panama or Darien as deep, as wide, and as free as the Straits of Dover, it would never become a commercial thoroughfare for sailing vessels, saving the outward bound and those that could reach it with leading winds. * * *

"We come now to the Nicaragua routes. * * * It is to this part of the Isthmus that we must look for a route that shall best fulfill the present requirements of commerce. * * * Vessels under canvas would in the main do the fetching and carrying for the Nicaragua route, which for reasons already stated they can not do for Panama. The aggregate amount of this

trade is immense, and it is neither accommodated for Panama nor Panama for it. * * * You will observe at a glance that the isthmus of Panama or Darien is, on account of these winds and calms, in a purely commercial point of view, the most out-of-the-way place of any part of the Pacific coast of intertropical America."

"The foregoing quotations from this eminent authority," says Lieutenant Collins, "certainly substantiate fully the deductions that I have already drawn from my own investigations. Better than that, they prove that my prejudice in favor of Nicaragua, if I have any, has not led me to overstate the case in its favor, but that, on the contrary, in my desire to keep within indisputably safe bounds I have greatly understated it."

WHY SAILING VESSELS DO NOT USE THE SUEZ CANAL.

It has been claimed by some critics that sailing tonnage would not figure appreciably in the traffic of an isthmian canal, and that in consequence the matter of winds may be disregarded in selecting the best location. This assertion is based, in the first place, on the fact that no sailing vessels, practically, have used the Suez Canal. If they will not use the canal at Suez, it is urged, they will not use an isthmian. It is a fact that no sailing vessels have passed through the Suez Canal since 1874, except during the time of the Turko-Russian war. In 1877-78, when a few sailing ships came through from Calcutta with Indian troops. But it appears from the report of United States Consul-General Long at Cairo that there is a very good reason why sailing vessels will not use the Suez Canal. He says:

The absence of sailing vessels in the canal is explained by the difficulties of navigation in the Red Sea. The extraordinary number of sailing vessels lost in the Red Sea (which is full of dangerous reefs and shoals) during the years 1852-73 seems to have effectually discouraged further attempts.

Thus it is evident that dangers to navigation in the Red Sea prevent sailing ships from using the short cut to the Orient, and that any disadvantages presented by the canal itself. Were it not for the difficulties of approach to and departure from the canal, it would be used as universally as it is by steam vessels.

So it would be in the case of a canal at Panama. The difficulties and dangers that would be experienced by sailing ships in the Gulf of Panama would prevent them from ever using a canal through the isthmus at that point. So this class of tonnage would have to be eliminated from the consideration of the earnings of the enterprise. And that the loss in earnings would be a very great there can be no doubt, when we consider how great a proportion of the trade of the Pacific to and from the Atlantic States and Europe is now carried in sailing ships. For the port of San Francisco alone that arrivals and departures of ocean-going sailing vessels equal or exceed those of steam vessels in the same trade.

SAILING TONNAGE OF SAN FRANCISCO.

In 1898 there were 494 arrivals of sailing ships, aggregating 530,092 tons, against 380 steam vessels, aggregating 592,865 tons; while the clearances were 419 sailing vessels, of 464,153 tons, against 331 steam vessels, aggregating 567,547 tons. In previous years the proportion of sailing vessels and tonnage is the same or greater, so that it is safe to say that for this port (and the same can be asserted for the other Pacific ports of the United States) the sailing tonnage in foreign trade equals the steam tonnage. In the grain-carrying trade of this port alone over 200 sailing vessels are employed each year, and there is no likelihood that the number will be diminished, for the sailing vessel is the most economical carrier of this kind of freight. And as wheat is carried from the Pacific coast almost exclusively to Europe, it will

be at once seen that a canal at Panama would prevent its use to fully 500,000 tons of shipping in the wheat trade alone, which would only too readily take the short cut through a canal at Nicaragua. Taking account of other than the grain trade, it is probable that the selection of the Panama route would prevent fully 1,000,000 tons of sailing ships from using the isthmian canal. Not only would the canal lose yearly a very large amount in tolls, but a very considerable commerce of the world would not be benefited by the canal. Its object would be only half accomplished.

When the great resources of our Pacific States, from Mexico to Alaska, are more fully developed; when, as in the case of California, instead of nine persons to the square mile, as we have now, the number shall have increased, as it will increase in the next decade, to twenty or thirty persons to the square mile, our products for export will double or quadruple in value, and so in that proportion will the demand for vessels to transport our surplus to foreign countries be increased.

WHY THE SAILING VESSEL WILL STAY.

But it is sometimes argued, and it has been so argued upon this floor again and again, that the sailing ship is going out of use, and so need not be given much consideration. But those who are interested in maritime affairs know that the day of the sailing vessel is not yet closed, and will not be while the free winds from heaven blow to fill her sails. The ports of the world, especially those of the Pacific, are filled with the tall masts of sailing fleets. There are trades and routes from which they can not be driven, and new designs, and such class of ships, barks, and five and six masted schooners, are contributing to the maintenance of the sailing tonnage of the world. By means of these new designs the cost of operation is being constantly reduced and an element of economy introduced into the ocean carrying trade. With a canal through Nicaragua which could be used by such vessels, an impetus would be given to this class of ocean carriers, especially to those engaged in trade between the Atlantic and Pacific coasts of North, South, and Central America. The result would be a lower average of ocean freight rates than would be the case were the Panama Canal built, excluding from this trade vessels moved by wind power, the very cheapest motive power known in the world. Commerce, therefore, would be benefited more by the Nicaragua than by the Panama route.

GREAT LOSS IF SAILING VESSELS CAN NOT USE THE CANAL.

Prof. Lewis Haupt, a member of the Isthmian Canal Commission, is distinctly and emphatically of the opinion above set forth. Professor Haupt not only gave this phase of the question particular attention as his part of the work of the Commission, but came to it with the great advantage of having served on two previous commissions which studied the problems involved in an isthmian canal. He has been over both routes. Although he signed the report of the Isthmian Canal Commission which gave a verdict in favor of Panama, he did so for these reasons, as stated to the Senate Committee:

I beg leave to say that while conceding to the wishes of the majority and signing a report in order to make it unanimous, and so, if possible, to secure legislation at this session, I still felt and did then that there were certain economic, physical, engineering, sanitary, and commercial advantages inherent to the Nicaragua route which gave it a decided preference over the Panama route.

In this, of course, I do not consider the cost of the concessions, nor especially the cost of constructing the canal, but I think the others are of so preponderating weight as to overbalance any difference in the latter two items. The economic advantage is, a priori, the most important factor in the operation and utility of an interoceanic waterway, and that is briefly summed up in the report of the Commission by the statement that the Nicaragua Canal possesses an advantage between home ports of one day for all north-bound commerce—that is, whether it be of European or American origin, or whether it has its destination in the Orient or North Pacific ports—and for all Gulf ports it would save about two days.

I have made an estimate of that saving, based upon the average cost of moving vessels of about 3,000 tons capacity, which I have figured at about \$250 a day. Some of these vessels have cost as high as \$1,000 a day to operate and maintain, and some of them as low as \$100 a day; but taking it at that average and estimating on a basis of 10,000,000 tons, of which, say, 75 per cent is north bound, the economy on that basis would amount to about \$650,000 a year on steam alone. But as a large percentage would be carried by sail if this route be opened, the economy would probably be 50 per cent more, or about \$1,000,000.

PANAMA AWAY FROM THE PATH OF COMMERCE.

Prof. Haupt further testified that the Panama route is directly away from the path of commerce, or nearly at right angles to it, so that every mile of the canal is a detour from the direct line of traffic, which is—

a violation of a sound engineering and economic principle, while every mile of the Nicaragua route is in the line of or is near the line of traffic as it is possible to place it. So that the difference in the length of the route which is urged as an objection to the Nicaragua route is in reality no objection whatever.

The only fault that I find with Professor Haupt is that he signed the majority report of the Isthmian Canal Commission. If I had a conviction, as I have, that the Nicaragua Canal route is the best and the most economical route I would do just what I am doing to-day. I would give the best reasons I could why we should adopt it. I would be consistent, as I was when I first espoused it twenty or thirty years ago, when I was president of the Chamber of Commerce of San Francisco. My course would be the proper one to steer. I think the Professor has permitted the opportunity for a good bargain to influence him, if I may say so. He is like Mrs. Toodles, who could not go into a store without buying something if it was cheap. So I think the Professor was fascinated with the apparently cheap price at which the Panama Canal, which had cost so much money, although the work which had been done is of no practical value, could be purchased. He thought it was a great bargain, and so he permitted his convictions that the Nicaragua route was the best to be influenced by the chance of a good bargain, and he joined with the majority of the Commission in recommending its purchase because it had cost so much and we could get it so cheaply.

Mr. FAIRBANKS. If the Senator will permit me, does he think that the testimony of a man who holds such unstable opinions would be of any value upon this subject?

Mr. STEWART. I should like to inquire, if that be so, why spend so much money on such a project as that of the Panama Canal?

Mr. FAIRBANKS. We are not proposing to spend this money upon his present opinion.

TONNAGE EQUALLY DIVIDED BETWEEN SAIL AND STEAM.

Mr. PERKINS. In answer to my friend from Indiana, I would say if nature has not given us in the Nicaragua route all these great advantages, why is it that my friend from Indiana and so many of his associates try to raise so many objections against it

and urge us to buy the Panama Canal route, a scheme which was conceived in iniquity? As to the work that has been done there, it is of no practical benefit whatever, so far as the construction of a canal is concerned. I will show later on, I think, if figures amount to anything, that it is an impracticable thing to build a dam there. We can damn the proposition, but whether we can damn the Chagres successfully and have a lake that will remain there during the dry season and will not wash away in the wet season is a question.

As to the total tonnage of the United States, Professor Haupt states that it is about equally divided between sail and steam, so that to benefit ocean commerce to the greatest extent the canal must be suited to the use of both kinds of ocean transportation. He confirms the opinion given above that the sailing ship will hold its own because of the greater economy in operating them, and instances as proof of this the rapid increase of large six and seven masted vessels of schooner rig.

I want to say to my distinguished friend from Indiana that to a layman—and I only speak from a layman's standpoint—his conclusions remind me very much of decisions I have heard rendered in courts. The judges reasoned splendidly; their arguments were all on my side of the case, but when they drew their conclusions they decided against me. Their arguments were good, but they decided differently from the way they reasoned. So it seems to me with Professor Haupt in this case. He reasons splendidly for the Nicaragua route, but he signs, with the majority of the Commission, on the other side.

THE ROUTE OF A SAILING VESSEL FROM PANAMA.

The Atlantic Refining Company, of Philadelphia, proposes to carry its oil in sailing vessels. Coal and all cheap material needed in manufactures are carried in this way, and will doubtless always be. For all of this traffic the Panama Canal would be prohibitory, for the reasons before set forth. In discussing this phase of the question Professor Haupt called attention to the fact that a sailing vessel going out of Panama Bay in order to make the best time to San Francisco would have to sail south to or near the Gallapagos Islands, on the equator, then west 1,500 miles in order to take advantage of winds and currents.

I want to say to my friend from Indiana that I have been becalmed in the doldrums about 5° south of the equator for six weeks, when there was not wind enough there to fill the sails, and we brailled them up in their gaskets to the mast. For six weeks we remained there in the doldrums, as I have said, with hardly a breath of air, certainly with not enough wind to create what we call a cat's-paw, with the water as smooth as glass.

It has been stated to me by residents of Panama—

Professor Haupt testified, confirmed by the consular reports, in which it is printed—that vessels have been longer in getting out of the bay and reaching their port of destination—Valparaiso or San Francisco—than the time required to sail from New York via Cape Horn.

He said the usual time is two or three weeks getting out of the bay, and he related an experience of the captain of the Pacific Mail steamer *Golden Eagle*, who, on leaving Panama, passed a sailing vessel 40 miles from that port, bound in, and after making the round trip to San Francisco and back, found the same vessel, on his return, still 10 miles from Panama, and still bound in.

HUNDREDS OF MILES OF TOWING PROPOSED.

Towing would not bring with it any advantage, for even to tow a sailing vessel outside of Panama Bay would require twice the towage needed through the Nicaragua Canal, and then she would not be in a position to catch favoring tides and currents. If such vessel were towed 130 or 150 miles from Panama, making the length of towage equal to that through the Nicaragua Canal, it was asked by Senator HARRIS if this extra towing would not be sufficient to get the vessel out to sea, to which Professor Haupt replied:

That is true in part, and yet when the vessel gets 130 to 150 miles out she has not got as good winds or as favorable currents as if she were at Brito, some 300 or 400 miles farther, because all the time that she is being towed she is moving southwardly or away from the line of her traffic and must sail back if northbound. The geographic position is such that it is a detour which ought to be avoided, and this is possible by the other route. I think that covers the question raised by Senator HARRIS as to the physical conditions with this closing remark, that inasmuch as we are building a canal for all classes of vessels, that the factor of using sail ought to be very carefully considered, and in that respect I believe firmly that the Nicaragua Canal is greatly preferable to one at Panama.

Under such conditions of navigation, it can readily be seen by those least experienced in nautical affairs that no sailing ship would venture the passage by the Panama Canal. The Bay of Panama would kill this traffic for the canal as surely as the Red Sea has killed it for the canal at Suez. I submit that there is no economic consideration which has been or can be raised in connection with the choice of routes for an isthmian canal which would justify the Congress of the United States in deliberately choosing a route which would drive from it nearly one-half of the traffic which is waiting to take advantage of a canal, and which could and would use the alternative route.

THE ENGINEERING PROBLEM.

Considering the two canal routes from the point of view of the engineering problems presented and the manner in which it is proposed to solve them, the conclusion is inevitable that the Nicaragua route should be selected by the United States. Where grave doubt exists as to the efficacy of the plans adopted for one route, while there is acknowledged to be absolute certainty in the case of the other, there can, it seems to me, be no hesitation in choosing the route from which the element of doubt is eliminated.

It is acknowledged that the Bohio Dam is the vital point of the Panama Canal. It is absolutely necessary in order to obtain a supply of water for navigation. It therefore should be constructed in such a manner as to render it safe beyond the shadow of a doubt, and to do this considerations of economy should not be too closely regarded. It is evident that in the case of the Conchuda Dam of the Nicaragua route the Commission has not done so. The dam there proposed is built of stone on a rock foundation and firmly anchored by running it 200 feet or more into the hills on each side. The site selected by the Nicaragua Canal Commissioners at Boca San Carlos was condemned by the Isthmian Commission for the reason that at that site the greatest depth of rock upon which the dam foundation must be laid was 130 feet. At the Conchuda Dam the greatest depth is 82 feet. "This question of depth of foundation," says the Isthmian Commission, "is very important, because the foundations will probably have to be placed by the pneumatic process, and the depth (82 feet) is well within that at which the foundations of many bridge piers

have been built by the same method." I think that this dam, constructed as planned by the Isthmian Commission, will be exposed to no danger of injury from any cause; but I do not think the Bohio Dam can be so considered.

THE BOHIO DAM.

In the first place, the Commission says that "for reasons of economy" an earth dam has been selected for Bohio. As it is even more vitally necessary to Panama than the Conchuda Dam is to Nicaragua, from the fact that it collects the necessary water, while the Conchuda Dam simply regulates an already inexhaustible supply, it is hard to see why economy should be exercised in its case and not in the other, unless for the purpose of making a favorable showing for the Panama route. The Bohio Dam is twice as long as that at Nicaragua and 85 per cent higher, making its vertical section 3.70 times as large. If the Panama Dam were constructed of the same material as that at Nicaragua, it would cost \$15,000,000, even if the dam itself were no thicker. Being higher and longer, safety would demand thicker masonry, and its cost would thereby be increased. If it were made only 20 per cent thicker, the total cost would be \$18,000,000, which would wipe out the difference in cost in favor of the Panama route and make the cost of the Nicaragua Canal less than that of Panama by a round \$6,000,000.

But an earth dam having been determined upon, let us see whether it is as satisfactory as its importance in connection with the canal demands.

The Technical Commission, which made exhaustive studies of the problem for the New Panama Canal Company, and the International Commission, composed of 14 engineers of world-wide reputation from France, Germany, England, Russia, Colombia, and the United States, agreed upon a plan for the formation of a lake at Bohio. This lake was to be made by the construction of an earthen dam 1,386 feet long and a maximum height above the surface of the river of 67 feet, impounding a lake of 21½ square miles. The extreme height from the bottom of the foundation was fixed at 99½ feet. In this plan it was proposed to have a second dam at a higher level at Alhajuela, to serve as a first regulator of the Chagres floods, and to prevent them from entering Bohio Lake furiously, as the "total volume of the freshets would certainly produce currents detrimental and dangerous to navigation."

WHAT EMINENT ENGINEERS THINK.

The omission of the dam at Alhajuela would necessitate the increase of several meters more in height [of the Bohio Dam], a scheme unanimously looked upon as overbold.

Again, in another part of the report, the commissioners state that—

This solution [of a second dam] is the only one meeting the conditions for regulating the freshets without giving the Bohio Dam such proportions as are considered too bold.

And again:

Considering the importance of that structure in relation to the safety of the canal itself, it was deemed that here, more than anywhere else, it was necessary to be very cautious, and consequently the maximum elevation of 30 meters (65.5 feet) was fixed upon as that of the level of the lake to be formed by the building of the Bohio Dam. * * * Such is the result to which we are led in considering direct feeding through the Chagres if we do not wish, in determining the proportions to be given to the structure of the dam, to deviate from the present rules which the commission consider as absolute.

In the light of this report of 14 of the most eminent engineers of Europe and America, can not the plan of the United States Isthmian Canal Commission be considered too bold? Is there not room to question the soundness of their decision and an opportunity given for the entrance of doubt as to the stability of the dam proposed by it at Bohio, and its efficacy at all times should it stand?

THE BOHIO DAM TOO BOLD A SCHEME.

In the first place, the United States Commission has increased the length of the dam from 1,286 feet to 2,546 feet, has raised its crest from 67 feet to 100 feet, and its total height from the bottom of the foundation from 93½ feet to 228 feet, while the pressure of water against it is raised from about 65 feet to 93 feet. Here is a structure which indeed the commission of engineers would undoubtedly condemn as far "too bold." Not only is the limit of perfect safety in height above river level, as established by them, exceeded by 49 per cent and the depth of water by 37 per cent, but the length of dam is doubted, making the pressure of water against it 2.74 times as great. And to retain this great lake an earthen dam is proposed of proportions which eminent engineers condemn as "too bold," while at Conchuda a solid stone dam, firmly anchored in abutting hills, is required to hold in check simply a pool less than a third as wide and not so deep. Besides this, in the case of the Bohio Dam 310 feet of the core must be laid by the pneumatic process at a depth of 128 feet below the sea level, a depth not hitherto attempted, I am informed. There is thus a doubt as to the ability to lay at this depth a structure of such a character as to meet all the requirements of the case.

And more than this. It is very doubtful whether the Bohio Dam, as planned by the Isthmian Commission, will, even if satisfactory as to strength and durability, accomplished what is expected of it. It will be remembered that the commission of engineers made a second dam at Alhajuela a necessary part of the plan of a lake at Bohio. In this, says the commission—

would be stored the volume of water necessary for the water supply and operations of the canal during periods of deficiency in the natural output of the Chagres, and that portion of the excess of the freshets which must be retained in order to restrict the oscillations of Bohio Lake to its strictly necessary limit, and thus avoid too great fluctuations of its surface.

A SECOND RESERVOIR NECESSARY.

The United States Isthmian Canal Commission, while omitting the second reservoir from its plan, has in view its contingency, and acknowledges that it will be necessary when the traffic of the canal exceeds 10,000,000 tons per year. Even our own Commission, therefore, states that at some time this second big dam must be built at Alhajuela, while the European and American experts contend that it must be constructed at the same time as the Bohio Dam, in order to insure unimpeded navigation of the canal. That it must be built, therefore, is certain, the only question being that of date. Its cost, in consequence, must be taken into account in estimating the total cost of the canal to the United States. No estimate is given by the Isthmian Commission, but as that body advises a stone dam it is probable that its cost will be at least that of the structure at Conchuda, or over \$4,000,000. By that sum, then, must the cost of the canal to the United States be increased, and still further augmented by the cost of a railroad to the site of the dam, which, at \$75,000 per mile, would cost \$750,000, or a total of \$5,000,000 for the additional water supply.

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Added to this must be the cost of additional lands required for the Bohio Dam and spillway, which the Isthmian Commission in its report of January 18 says are necessary. The estimated cost of these lands is not given, but will of necessity be considerable and must be added to the cost of the Panama Canal as given by the Commission.

Mr. President, I might go on and give my own views and experience in the construction of dams for the storage of waters, for I have had some very considerable experience in that line, but I deem it much better to offer the testimony of these experts, who have given this subject-matter their personal and careful consideration, than to criticize their mode of constructing a dam and discuss the probability of its being able to withstand the great freshets and the great fall of water from the heavens in that country.

MEMBERS OF THE COMMISSION UNCERTAIN AS TO THE FEASIBILITY OF THE BOHIO DAM.

The opinion as to the uncertainty attending the construction of the Bohio Dam is borne out by the testimony of the members of the Isthmian Canal Commission before the Senate Committee on Inter-oceanic Canals. Admiral Walker gave evidence that everything, so far as a canal is concerned, depends on the stability and efficiency of that dam. Here is an extract from the testimony on that point:

Senator HARRIS. Mr. Morison not only objects to the cost, but he has some apprehension with regard to the construction of the dam [at Bohio]. He says it involves "novel and untried features." Few engineers even among those who feel that they could construct it would be ready to say in advance how the work would be done. The difficulties taken in connection with the climate and other surroundings are enormous.

Admiral WALKER. Yes; it will be a difficult work. Senator HARRIS. He also speaks in another place in this article of the extreme difficulty of getting the work of the caissons at the bottom and making the foundation water-tight. In fact, he says here, "The design involves the extension of pneumatic work to unprecedented depths, involving special details in making the joints between the caissons," and it is owing to his doubt, apparently, of the success of the work that he strongly recommends the other plan.

Admiral WALKER. I think he agreed that the work could be done, but he thought there would be a large saving of money in building a different style of dam, and that the style of dam which he advocated would be a sufficiently good one. It was a question of seepage—of how much water would go under the earth dam which was proposed by the French engineers and that which is proposed by Mr. Morison, whether enough would go under to make it dangerous.

Senator HARRIS. The fact is with regard to the Bohio dam that the nature of that is just as much an unknown quantity as the future of the dam at Conchuda.

Admiral WALKER. I should say it was more of an uncertain feature. It is a greater work and a more difficult work to build. The Conchuda dam I look upon as practically settled.

Senator HARRIS. So that we know no more about the possibilities and contingencies at Bohio than we do at Conchuda; in fact, less?

Admiral WALKER. We know less about the contingencies at Bohio, but that is the only point in the whole line about which we are at all uncertain. Senator HARRIS. But that is the vital point.

Admiral WALKER. That is the vital point. Yes, it is vital to the canal, because the safety of the canal depends on the integrity of the dam in both cases. I know of nothing along the Panama line which is not well within engineering precedents with the exception of the dam at Bohio, which is a very large work and would have to be carefully considered.

THE CONCHUDA DAM IS SAFE AND PRACTICABLE.

From this evidence before the committee it thus appears that

Admiral Walker considers the Conchuda Dam, on the Nicaragua route, as practically settled. No question regarding its safety or efficacy can be raised. But it is wholly different in the case of the one vital point on the Panama route—the Bohio Dam. En-

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gineer Morrison, a member of the Commission, intimates that few engineers feel that they could construct it, but that if undertaken the difficulties would be enormous. As an alternative he proposed a dam of a type which the Commission regarded unsafe. So these two advocates of the Panama route can not agree on a practicable and safe dam for that route.

And here another member of the Commission testified as to the difficulties if not impracticability of the Bohio Dam. Professor Haupt, before the Senate committee, emphasized the importance of this dam to the canal, stating that the integrity of the entire line depends on the ability to build and maintain it. But he had grave doubts as to the possibility of doing so, pointing out the fact that the experience in sinking caissons in bridge work 110 feet, which it is claimed has been done, gave no ground for belief that a concrete wall could be laid at a depth of 128 feet. The character of the work to be done is entirely different, as he thus explained before the Senate committee:

CHARACTER OF WORK AT BOHIO.

Mr. HAUPT. A bridge pier is usually composed of only one isolated structure placed upon bed rock or other suitable material, whereas in this case there are a series of those structures which must be placed in juxtaposition, and then the space between them outside of this bell or caisson must be filled in and made impermeable. Otherwise the dam will leak at the bottom under the pressure, and that is the serious part of this question.

These caissons are supposed to be placed as nearly contiguous as possible, and then the spaces between them are filled in by "fillers," or what might be called dowels, set in grooves between the caissons. If the grooves do not come exactly opposite, there is difficulty in getting those spaces closed, and the whole space between the ends of the abutting caissons must be filled thoroughly with concrete or impermeable material, although concrete is not entirely impermeable. * * *

In the drawings shown for the Bohio Dam, in studying it critically recently, I noticed the caissons are not shown as going entirely to rock through their whole base, but one edge of them only rests upon the rock and the other edge on sand.

Senator HAWLEY. When you speak of rock do you mean granite?

Mr. HAUPT. It is the kind of rock met at that particular place; the borings show hard rock. I do not remember the character of it. It may be a hard limestone. The caissons must be sunk farther really than the depth to the surface of the rock, because if one edge touches on the edge of a sloping rock that must be excavated and the whole bed be leveled off for the entire length of each of the caissons.

Senator HARRIS. Do you mean to say that the Commission did not provide for an excavation to level bearings of each caisson?

Mr. HAUPT. That is what the drawings show. I was surprised to find it so. In the case of the Panama Dam it is not, as it is in this case at Nicaragua, where the caissons are shown as penetrating the line of rock throughout their whole length but at Bohio the print shows that the bottom line is half in rock and half in earth. Of course that would be a failure, and it is probably an oversight on the part of the draftsmen which has escaped the criticism of the committee having it in charge. I presume, however, that the estimates are based upon the sinking of those caissons into the rock and the leveling off of the bed for a bearing.

Senator FOSTER. Are there any such unknown or uncertain elements entering into the construction of the Nicaragua route?

Mr. HAUPT. No; there are not.

Senator HARRIS. There really is no point along the entire Nicaragua route—no question which is not well within the limitation of ordinary, you may say, engineering experience.

Mr. HAUPT. That is correct; yes, sir. There are three possible dam sites, either of which would be better than that one on the Nicaragua route. Each dam site is better than that. The San Carlos dam site is better, and so is that at Ochoa; so is the present Conchuda, and it is possible by further boring that we may find a still better site.

INSUFFICIENT DATA AT BOHIO.

Professor Haupt read to the committee the final report of the Commission, a description of the borings made at Bohio, which shows that sufficient data was not secured as to the physical conditions of the foundation on which the dam must rest, lack of

which data introduces an element of uncertainty that, added to the defective structure of the core-wall foundation, will condemn the Commission's plan in the eyes of any impartial engineer.

It is essential—

Says Professor Haupt—

that the gorge be absolutely sealed by this core wall, and that involves the fundamental idea that the foundations shall be so placed on solid rock as to prevent seepage.

This fundamental idea has been carried out at Conchuda, but not at Bohio.

Mr. Morrison, in his testimony before the Senate committee, acknowledged that there were uncertainties in regard to the practicability of the Bohio Dam as planned by the Commission.

If—

He said—

you come right to the facts, I do not consider that the solution of the dam given by the Commission was the wisest one.

NEW AND UNTRIED PROBLEMS.

Colonel Hains, in his testimony, speaking of the Bohio Dam, in answer to the question whether he thought the dam as planned by the Commission a safe one, said:

I do not think that the question of the best type of dam for that place has been definitely settled. * * * You see these borings came in very late, and we got up that plan for that dam; but before any dam is built down there I suppose the engineer that undertakes it would want to take a thousand more borings.

Senator HARRIS. I have one more general question that I wish to ask you. Is there any engineering work on the Nicaragua line that is not easily within the limits of present engineering experience and knowledge?

Colonel HAINS. On the Nicaragua?

Senator HARRIS. Yes.

Colonel HAINS. I think not.

Senator HARRIS. There is no work there, either in the way of dams or locks or cuts, that involves any new and untried problems?

Colonel HAINS. No, sir.

Senator KITTREDGE. Is there on the Panama?

Colonel HAINS. I don't think there is in Panama unless it is this dam.

Senator HARRIS. Well, I thought we had discussed that, and I will put the additional question and refer to what Mr. Morrison says. Mr. Morrison thought it involved "new and untried problems," the construction of this dam.

Colonel HAINS. Yes.

Senator HARRIS. And you agree with that?

Colonel HAINS. Yes; I agree with that.

Colonel Ernst, in his testimony, said that the Conchuda Dam as planned by the Commission "is a much easier dam to build and a better dam than the Bohio Dam."

General Abbott testified that the plan of the Commission for the Bohio Dam "approaches the limits of uncertainty."

Whatever more evidence there may be as to the uncertainty surrounding the practicability of the Bohio Dam as planned by the Commission, it seems to me that sufficient evidence has been adduced from members of the Commission itself to render it certain that the Congress of the United States should not adopt the Commission's recommendation. On the other hand, there can be found, I think, no word of criticism of the plan proposed for the Conchuda Dam. It is practicable and safe, presenting no engineering work that is not within the experience of engineers. With this evidence before the Senate I do not see how it can select the Panama route. Common prudence will forbid it from investing nearly \$300,000,000 of the people's money in an undertaking where the vital part of the work presents so much uncertainty and fails even to inspire confidence in those who planned it.

STEAMSHIPS CAN GO THROUGH THE NICARAGUA CANAL UNDER THEIR OWN STEAM.

An effort has been made to show that the Nicaragua Canal as planned would be less available for shipping than that at Panama on account of more curves and sharper curvatures. But Admiral Walker, who questioned by the Senate committee, testified that there would be no difference between the routes in this respect. Vessels can pass through both canals without difficulty, as appears from the following testimony:

Senator HANNA. Do you think that any large ship—the maximum-sized ship—operating in this canal could go around these bends without the aid of a tug? I mean steamship or otherwise.

Admiral WALKER. I think they would go without a tug by both canals.

Senator HANNA. Could they make all the turns?

Admiral WALKER. I think so.

Senator HANNA. Suppose the wind was blowing pretty hard?

Admiral WALKER. If there was a strong breeze, it might occasionally cause some trouble. By the Nicaragua line there would at times be a considerable current from the lake to the Conchuda Dam; with a strong wind blowing and a strong current they might have difficulty without a tug, but under ordinary circumstances I think they would go through without difficulty.

Senator HARRIS. Did not the Commission work out this question of curvature in detail in such a manner as to show clearly that no curvature is estimated in this work which would involve any difficulty in a vessel passing through there?

Admiral WALKER. I think there are no curves that would involve any particular difficulty ordinarily. Of course, with a strong wind blowing or with a strong current, a large ship might get into some trouble.

Senator HARRIS. That might happen anywhere on either route.

Admiral WALKER. Yes; but both routes are practically good enough for steamers to pass through with their own power.

DIFFERENCES OF CURVATURE IN THE CANALS.

Although in the matter of curvatures there is a considerable difference in favor of Panama, this difference is equalized on the Nicaragua route by making the canal wider at the turns. Admiral Walker testified that this widening was made in every case. He also stated that there is one curve on the Panama route that is sharper than any on the Nicaragua route. But as planned, according to the Isthmian Commission, a vessel can go through the Nicaragua Canal as safely and as easily as it can through that at Panama. On this score there can be no choice between the two routes. This is the opinion of the Commission. In this connection it must be remembered that on the Nicaragua route there are only 73.73 miles of canalization against 36.41 at Panama, the rest of the route being slack-water river navigation for 39.37 miles and 70.51 miles of lake navigation. The slack water of the river, whose channel is straightened by cutting through points of land, is really an arm of the lake through which there is discharged 76,000 to 83,000 cubic feet of water per second against an average annual discharge of only 3,200 cubic feet per second for the Panama Canal. With twenty times as much water over the San Juan arm of the lake as is available for the Panama Canal, and with unlimited water in the lake itself, it is easily seen that the navigation of 110 miles of the Nicaragua route will be virtually only a part of the voyage, and that comparison with Panama is possible—only 73.73 miles against 36.41 miles for Panama—considering the 13 miles through Lake Bohio as lake navigation. But, as before stated, the Commission is of the opinion that there is no ground for choice between the two routes on this score.

SOME MISLEADING DATA

There have been introduced as an argument in favor of the Panama route the replies of navigators to a set of questions pur-

porting to give conditions to be met with in navigating the two canals as planned. When we consider the nature of the data on which the questions were based, not much wonder may be felt at the character of the answers, for the data in the two most important cases were misleading, unintentionally no doubt, but still misleading. These ship captains were asked concerning the difficulties of navigating the Nicaragua Canal, with "over ten curves more than twice as sharp as those on the Panama route." Now, a curve that is twice as sharp as another is one which has only one-half the radius, which is a very serious matter, and it can not occasion surprise if the ship captains chose the ten curves with twice the radius of the short ones. But the fact is that the shortest curves on the Nicaragua route are not by any means twice as sharp as the sharpest on the Panama line, leaving out of consideration the curve from the harbor at Colon, which is by far the sharpest on either line.

Leaving this out of the case, then, the shortest curve on the Panama route is found to be of 6,243 feet radius, while the shortest on the Nicaragua route is 4,045 feet, approximately two-thirds of the radius of the Panama curve. The sharpness of the curves thus stand to each other in the proportion of three-thirds for Panama to two-thirds for Nicaragua, which makes the Nicaragua curve just one-third sharper than the Panama instead of twice as sharp. Thus, the actual curvature being in the proportion of four-sixths instead of three-sixths, the captains were questioned upon the basis of a curvature just 25 per cent sharper than actually exists.

Now, there are nine more curves of under 6,000 feet radius, running from 4,175 to 5,927 feet on the Nicaragua route, all of greater radius than that referred to above, to be compared with this short curve on the Panama route, so that the error of data becomes progressively more flagrant as we proceed through the canal. In fact, the proposition placed before the captains is so widely misleading that the answers that they gave on the comparative difficulties of navigation have no material bearing on the conditions as they will exist when the canal is constructed.

WHY THE EVIDENCE OF CERTAIN NAVIGATORS IS NOT CONCLUSIVE.

On another very important point the data placed before them was equally misleading. Here is the question that was asked them:

Consider both canals open and yourself bound from New York to San Francisco in a sailing ship, using the Nicaragua Canal you would have to be towed through the entire length—161 miles.

Through the Panama Canal you would also be towed 47 miles. By keeping your tug which would take you through the Panama Canal and letting it tow you straight out to sea 140 miles, you are out of the calm belt and have wind, having towed the same distance only as you would to have gotten through the Nicaragua Canal.

In view of all the conditions, winds, curves, calms, etc., governing each route, which canal would you use?

The answers are unanimously for Panama.

But are the conditions fairly stated here? I respectfully submit that the evidence is that when you get 140 miles away from Panama you are no more likely to catch a breeze than you are at Panama itself, where, in the days of the stampede to the California gold diggings, passengers on sailing ships in Panama harbor saw steamers leave on the run to San Francisco and return therefrom before they could find wind enough to start on their journey to the land of gold. Lieutenant Maury states, regarding the calms within whose range Panama lies, that he has known

vessels going to or from Panama to be detained by them for months at a time. Hesays, as previously stated:

On one occasion the British Admiralty, wishing to send one of their vessels into the Arctic Ocean from Panama in time to save the season, had her towed by a steamer through this calm belt and carried 700 miles out to sea before she could find a breeze.

It is evident that the captains, in answering the above questions, assumed when it was erroneously said that they would find "wind" 140 miles out that a fair wind up the coast was meant. This, however, is practically never found. As will be seen from Lieutenant Maury's sailing directions, the only two courses open are to sail south—usually to the equator—about 600 miles, and then work westward for about a thousand more. Under such circumstances it is easy for even a landsman to see that there is no ground whatever to choose the Panama instead of the Nicaragua route, as from Brito a sailing ship is almost sure to at once catch a breeze and bear away on her course. You know, Mr. President, that there the trade winds prevail, and in this longitude, for certain seasons of the year, those winds blow continuously, and the vessel at that point receives the trade winds. The answers of the captains, therefore, to these hypothetical questions must be taken with as many grains of salt as exist in the element on which they make their living.

Mr. HARRIS. Will the Senator from California allow me?

Mr. PERKINS. Certainly.

Mr. HARRIS. I will state that the chart submitted by the Hydrographic Bureau shows clearly the state of facts which the Senator from California suggests, that the hundred and forty miles towage would practically amount to nothing in reaching the trade winds.

Mr. PERKINS. I will say to the Senator that before he came into the Senate I read the sailing directions which were given by Lieutenant Maury, author of the theory of winds and currents of the ocean and a world-wide acknowledged authority upon the subject-matter. I think, as the Senator has stated, there can be no question as to the correctness of the position which he takes.

HEALTHFULNESS OF THE TWO ROUTES.

As to the healthfulness of the two routes there seems to be no room to question the very great superiority of Nicaragua. In its report the Commission did not indicate a preference, contenting itself with calling attention to the fact that during work on the maritime canal in Nicaragua the health of the working force was good, while the mortality at Panama was notorious. Colonel Hains testified that in regard to sanitary conditions the advantages are decidedly in favor of Nicaragua. Mr. Noble also thought that the advantages would be on the side of Nicaragua. Admiral Walker said that people would be more likely to contract sickness on the Panama line because the Isthmus has been a highway for hundreds of years, while on the Nicaragua route there have been practically no inhabitants. The consensus of opinion on this point is clearly and emphatically in favor of Nicaragua, and, as has been testified by engineers, the question of healthfulness of climate has a very important bearing on the cost of the work. There can be no question about the fact that because of the health conditions the canal at Panama will cost from 25 to 50 per cent more than at Nicaragua.

In respect to military advantages I do not think there can be any question as to the superiority of the Nicaragua route. This

is acknowledged by Colonel Hains, who points out the fact that it is the shorter line between the two coasts of the United States.

In industrial and commercial value Colonel Hains is also of the opinion that Nicaragua has the advantage. In this opinion I think everyone will concur, for it is well known that there is an opportunity for development of a large and rich adjacent country, under favorable climatic conditions, whereas the condition of the Isthmus of Panama, after the years during which it has been a highway of travel, is practically no better developed than when it was a possession of Spain.

THE QUESTION OF TIME OF CONSTRUCTION.

Another advantage of the Nicaragua route, as planned, is the time necessary for construction—only eight years against ten for Panama—with the chances in favor of reducing the time on the former route and none on the latter, where the conditions to be met are as fully known as is possible in advance of further actual work. The Commission has figured very closely on Panama, but very liberally on Nicaragua. The chances of a reduction of time for the latter are far greater than for the former. In fact, all the greatest difficulties of the Nicaragua route are known, but it is doubtful if, in spite of all the work done at Panama, all difficulties of that route have been realized. This is a point which has been raised by Mr. Lyman E. Cooley, the eminent engineer who constructed the Chicago drainage canal, and who has personally examined both isthmian routes. He puts the situation very tersely. I consider Mr. Lyman E. Cooley one of the best engineering authorities in this or any other country. The Chicago drainage canal, to my mind, is one of the great achievements of this generation. The work has gone along quietly, with no display, with no talk, and yet the economy with which it has been done and the stability with which the canal has been constructed confer the highest encomiums upon those who have directed its work. Mr. Cooley says:

And there is another element of doubt also as to whether the Frenchmen have not been up against a real problem as to whether it really was all steel and all incompetence, and whether Americans are at least twice as honest and twice as competent, or three times as honest and three times as competent, or somewhere in that ratio. It depends on where you draw the line as to honesty and competency between Americans and Frenchmen.

If it is the aggregate of an American in honesty and competency be worth six Frenchmen, then the last estimate stands. If he is only worth four, you have got to add 50 per cent [to time and cost].

MORE OF NICARAGUA'S ADVANTAGES.

Another advantage of the Nicaragua route is the greater likelihood that material reductions in cost of construction can be made there than on the Panama route, owing to the extremely liberal estimates which the Commission has made and the greater number of points where in future reduced expenditures may on further examination be found possible.

Still another advantage of the Nicaragua route is the lower lift of the locks, the highest on this route being 37 feet against 45 at Panama, the latter being not only beyond engineering precedents, according to Professor Haupt, but exposed to greater deterioration if constructed. Besides this, two 45-foot locks in a flight, making a practically continuous lift of 90 feet, would be far more liable to injury from earthquakes than the single lower lifts on the Nicaragua route.

The Commission estimates that the cost of maintenance of the Nicaragua Canal will be \$1,300,000 per year more than that of

Panama. But with this estimate Professor Haupt does not agree. He testified before the Senate committee that the difference would not exceed \$900,000. But it is probable that this excess can be materially reduced, as it would undoubtedly be found necessary to add to the expenses incident to the Panama route the interest on an entirely new set of hospital buildings, as it is not probable that competent American physicians and surgeons would consent to place new patients in the existing structures, which are, and for years have been, infected with yellow and pernicious malarial fever. The extravagance of the police department is obvious. This is placed at \$908,300 per annum at Nicaragua and \$351,000 at Panama, a difference in favor of Panama of \$257,300, or more than one-half. All the figures given are increased by a 20 per cent contingency. Adding this to the Nicaragua estimate of \$508,300, we have for police at Nicaragua \$609,900 annually. In the Philippines each United States soldier (including officers) is estimated to cost \$1,500 per annum, and the cost at Nicaragua should be rather smaller than greater. On this cost the Nicaragua route will need 406 police force! An energetic man would guarantee, I think, an efficient service with 75 men—50 on eastern and 25 on western division—in time of peace. In war time an army might be needed to aid at either route.

THE ARGUMENT BASED ON COST OF MAINTENANCE.

This, I think, is a fair sample of, to say the least, the very liberal estimates of the Commission as to the cost of maintenance. That they are liberal, indeed, for the Nicaragua Canal is evident from the letter of Mr. Cooley, which was read here the other day by Senator TURNER. Mr. Cooley states—and the statistics given by him are convincing—that the cost of maintenance would, on a liberal estimate, vary from \$1,100,000 to \$1,500,000 per year, or less than one-half the Commission's estimates.

But even assuming that the difference in maintenance is \$1,300,000 in favor of Panama, should it be considered an argument in favor of that route? I think not, for the reason that from the Panama route are barred all sailing vessels, which could and would use the Nicaragua route. What this means is clearly set forth by Mr. Cooley in his testimony before the Senate committee. He there said:

We will assume that a vessel can steam 3,000 miles for a dollar a ton. That is about the way of reckoning it when rates are running normally. On long routes it is something better than that. On a sailing route between San Francisco and Liverpool or Portland and Liverpool on wheat it is, say, a third of a mill per ton per mile. If you can save 50 miles, you save a sixth of a dollar on every ton of freight that is going through there. If it is 7,000,000 tons, that is \$1,250,000 a year. Now, you have got 20,000,000 capital to your credit on account of saving this 50 miles, and you have got \$1,250,000 a year in saving on the total traffic on the cost of running it by the shorter route. This is an offset against the excessive estimates for cost of operation and maintenance.

It is perfectly clear that the extra tonnage gained through sailing vessels would, in tolls, more than make up for the difference in maintenance of the Nicaragua Canal, while the direct gain to commerce would be immense. The low rate by sailing vessel via Nicaragua would develop to an enormous extent the trade in coal, lumber, cotton, iron, and all bulky and cheap commodities, leading, in turn, to the rapid increase in the number of sailing ships. The trade in oil alone, which, as has been pointed out, is being transferred from steamships to sailing vessels, would be a very important feature of the Nicaragua traffic. All the wheat and flour shipments to Europe would go via Nicaragua by sail. In fact, the

possibilities of the Nicaragua route and their relation to commerce far outnumber those of a canal by the Panama route, compared with which the less cost of maintenance of the Panama Canal would be a mere bagatelle.

NEARER TO ASIA BY NICARAGUA.

Not the least of the benefits which the Nicaragua route would confer upon Atlantic coast commerce would be the fact that it would place our Atlantic ports from 377 to 579 miles farther within the Asiatic zone of competition with Europe than would the Panama route. In the sharp competition which we shall have from Europe in Asiatic markets this 500 miles more or less is important. How important may be realized from the fact that when China buys from the world's markets as much per head as does Japan now—about 83—she will buy products worth \$1,200,000,000. Every mile saved in transportation will give us a larger share of the vast trade which the Orient is about to develop. If we have no canal at all, we shall have little share, comparatively, in Oriental commerce.

AN EMINENT ENGINEER'S OPINION.

I do not think that the case can be more concisely summed up than it is in a letter to me by the distinguished engineer of the Chicago drainage canal, Mr. Lyman J. Cooley, who not only has had more practical experience in canal construction than any American engineer, but who has critically examined both the Panama and Nicaragua routes. He writes:

1. As planned, I consider the Nicaragua Canal to be the safest. It has no tandem locks, the Conchuda Dam is less formidable than the one at Bohio, and the cuttings are less menacing on account of length and depth.
2. The estimates are more closely figured for Panama. The Commission in effect so states.
3. The actual cost (including purchase price) is more likely to exceed the estimates for Panama on account of health conditions. The work in Nicaragua can be done for the estimate by a syndicate on its own plans, as I have outlined in my testimony. What the cost will be under a different organization can not be judged until the programme and the men who are to execute it are known.
- 4 and 5. The water supply at Nicaragua can not be questioned. The discussion of the matter has arisen through an endeavor to regulate the lake level too closely. The supply provided at Panama is admitted to be inadequate for a large traffic, and is to be supplemented at a future time by a dam or dams in the upper Chagres basin. The water supply at Panama can probably be made sufficient for all future needs, though I am unable to say what would be the results of an extremely dry year. I do not regard the water supply for Panama as at all comparable to that for Nicaragua.
6. As designed, the Bohio Dam is not as safe as the Conchuda Dam. (See testimony as to dams.)
7. There is more money in the canal at Nicaragua for the contractor at the figure of the Commission. This would be especially true if the contractor can substitute an equivalent canal at Nicaragua; no material change can be made at Panama.

You will note that I refer to an equivalent canal. I believe the eastern division at Nicaragua can be treated differently and thus facilitate construction, shorten time of passage, and reduce the cost of operation and maintenance.

Aside from technical questions, I believe that the Nicaragua route is greatly superior, for the following reasons:

1. It is much shorter to 75 to 90 per cent of the trade in which we are interested.
2. The healthfulness is greatly superior, both for construction and for operation and maintenance.
3. The country has large natural resources, and is capable of habitation by white men, as much so as the Gulf coast of the United States.
4. Military security is insured by a population of our own citizens rather than by fleets and fortifications.
5. It is available for sailing ships, for which the Panama route is practically prohibitive.
6. It is most nearly an extension of our coast line, and no foreign nation

can hereafter construct a canal within these limits, as they might if we built at Panama.

7. The Panama route is tainted by scandals and quered by failures, which make it a disheartening enterprise from engineering and contracting standpoint.

8. The Nicaragua route has been accepted and advocated on its merits for twenty-six years before the American people, and has always been admitted as superior for a lock, even by the Frenchmen prior to their failure.

9. It is a diplomatic mistake to now assume that the recent French project is really the meritorious plan and then proceed to force a distasteful bargain on the French shareholders and virtually the French people.

10. The dignity of the United States requires that it abide by the uniform determination of its engineers ever since the Commission of 1853.

I trust that the foregoing covers sufficiently the points which you have raised. You are at liberty to make such use of this letter as you may see fit in the interest of the common welfare.

THE VOLCANIC QUESTION.

The only argument which at this time can, it seems to me, receive any consideration whatever, is that which makes use of the fear inspired by the recent volcanic disturbances at Martinique and St. Vincent. Those terrible manifestations of volcanic energy are used by the friends of the Panama route to excite the imagination to picture the destruction of Nicaragua. Attention is called to the fact that there are volcanoes in Nicaragua and Costa Rica, and it is therefore asserted that a canal located there would be liable to be overtaken by the fate which befell St. Pierre. They are dotted all over the maps here [indicating], showing us that at any moment the slumbering volcano may belch forth and destroy this canal if it is constructed. Those volcanoes have increased and come into active operation to an alarming extent within the past few months, while this canal bill has been under consideration, and calculated to excite the fear of those who have read of the frightful occurrences in the island of Martinique.

But attention is not called to the fact that the volcano nearest to the line of the canal is 16 miles distant, and that whatever destructive results might follow an eruption could be only through accompanying earthquakes. And this subject of earthquakes was exhaustively studied by the Isthmian Canal Commission, which, in its report, states that—

The entire Isthmus between North and South America (including Panama) is a volcanic region. * * * No portion is exempt from earthquake.

The Commission found for points on the line of the Nicaragua Canal a record of 14 earthquakes, only one of which, in 1844, caused serious injury. At that time Rivas, 4 miles from the canal line, was almost destroyed and damage was done at Greytown. The volcano nearest to the line of the canal is 16 miles from Rivas. The other volcanic cones vary from 40 to 500 miles distant.

THE HISTORY OF THE CITY OF RIVAS.

But, the Commission points out, Rivas has had a continuous existence since a period antedating the conquest. At Panama the Commission found a record of 28 earthquakes—twice as many as along the whole Nicaragua route. Of these, 12 occurred in the years 1882, 1883, and 1884. The most destructive one occurred in 1821, when Panama was destroyed. The next in severity was in 1832, when the front of the cathedral at Panama was thrown down, the canal headquarters building cracked, the track and roadbed of the railroad thrown out of line, and the masonry of three or four bridges and culverts damaged. At Las Cruces the church was thrown down; at Colon some lives were lost and crevasses were opened, while the Jamaica telegraph cable was broken. The Commission then goes on to say:

The effect of the undulations of the earth's surface upon any structure increases with the height of the structure above the ground. A force which would leave the foundation intact might throw down a high wall.

The works of the canal will nearly all of them be underground. Even the dams are low compared with the general surface of the country, and with their broad and massive foundations may be said to form part of the ground itself, as they are intended to do. The locks will all be founded upon rock. It does not seem probable that works of this kind are in any serious danger of destruction by earthquakes in a country where lofty churches of masonry have escaped with a few minor injuries.

It is possible and even probable that the more accurately fitting portions of the canal, such as the lock gates, may at times be distorted by earthquakes, and some inconvenience may result therefrom. That contingency may be classed with the accidental collision of ships with the gates and is to be provided for in the same way, by duplicate gates.

It is possible also that a fissure might open which would drain the canal, and if it remained open might destroy it. This possibility should not be erected by the fancy into a threatening danger. If a timorous imagination is to be the guide, no great work can be undertaken anywhere. This risk may be classed with that of a great conflagration in a city like that of Chicago, in 1857, or Boston, in 1872.

It is the opinion of the Commission that such danger as exists from earthquakes is essentially the same for both the Nicaragua and Panama routes, and that in neither case is it sufficient to prevent the construction of the canal.

On this point Professor Haupt, in his testimony before the Senate committee, said:

As to the question of seismic disturbances I would only add that it has been shown by students of seismology that the presence of active volcanoes act as a safety valve for internal disturbances, and the number of craters along through Nicaragua and Costa Rica being quite large, it affords a vent for any internal stress of the earth, and therefore there are fewer injurious earthquakes in that section of the world than at Panama or elsewhere, and I was very much surprised, in studying that subject, to find that the percentage of earthquakes was lower in Nicaragua than in almost any other portion of the world. Now, we have had some earthquakes in this country recently, one in St. Louis and one in Oregon, and many in California, so that so far as that goes, it shows that there need be little anticipation of trouble from that source.

A SCIENTIST'S EVIDENCE AS TO SEISMIC DISTURBANCES.

Prof. H. Pittier, a resident of Costa Rica, who has given the subject most careful study, made a report to the United States Canal Board in 1895 concerning earthquakes in Costa Rica and Nicaragua, in which he says:

Although the whole of the main mountain range which runs from the shores of the lake of Nicaragua to the southern boundary of Costa Rica is probably of igneous origin, it may be asserted that the volcanic phenomena are in their latest period of activity, as seems to be generally the case all throughout Central America. Instead of the 20 volcanoes given for Costa Rica by Montessus de Ballore in his work, Tremblements de terre et éruptions volcaniques au Centre-Amérique (Gijon, Eugène, 1880), there are in reality only four peaks or small mountain groups still showing signs of activity, viz. Miravales, Poas, Irazú, and Turrialba. There is not a single active crater south of a line going along the railway and main road from Limón to Puntarenas. I do not know of any record of an eruption of the Miravales since the times prior to the conquest. The Poas is a peyser subject to great variations in the intensity of its manifestations. The last eruption of Irazú, which took place in 1888-89, was altogether insignificant.

Turrialba is probably the most lively of our fire mountains. From May, 1861, to the end of February, 1869, it kept throwing at intervals an enormous amount of cinders or volcanic sand, which was carried as far as the Pacific coast by the trade wind. When I visited Turrialba, in 1879, I only found a large chimney opened in the wall of an old crater, and through which escaped continuously a hissing column of sulphurous steam. But all through the surrounding region there were scattered evidences of far more active phenomena.

Since the foundation of our meteorological observatory good series of seismic observations have been taken at San José, and it is well to note here that, according to them, most of the shocks seem to be propagated in an undulatory way and in such a direction as to allow it to be supposed that they derive their origin in the volcanoes of Poas and Irazú. However, in the actual state of our knowledge concerning the Costa Rican seismology, it would not be prudent to draw any positive conclusion as to that point.

As to the geological age of our volcanoes it can be asserted that the more ancient among them are posterior to the middle of the secondary period and that their greater activity took place posterior to the Pliocene epoch. * * *

I took every pains to find an instance of shocks having been felt at Limon or in the settlements along the Saramiqui and San Carlos rivers during that period, but persons of sound judgment and perfect honesty, most of them foreigners, who lived for years in those places could not refer to even a slight case. Therefore, I consider it a safe conclusion to say that these seismic disturbances were almost invariably limited to the Cordillera and its immediate vicinity. * * *

Considered by themselves only earthquakes can not, in my opinion, be taken as a serious obstacle to the building of canals or railways in these countries. But it is not so when they occur in connection with the copious rains which characterize our climate. In itself the rain is a dangerous element, which penetrates the soil, loosens the clay or argillaceous strata, and very often produces considerable landslides. The soil may be soaked with water without giving way, but a sudden seismic shock can easily bring on a catastrophe. However, the general topography of the zone crossed by the western division of the canal, as far as my knowledge of the region allows me to state, does not seem to admit the possibility of easy movements of the superficial strata, and, moreover, the rain is much less in the Isthmus between Lake Nicaragua and the Pacific Ocean than on the eastern slope, as may easily be seen in the last paper of Professor Harrington on Central American Rainfall.

NO GROUND FOR CHOICE.

The recent report that there has been, within a few months, activity of Nicaraguan volcanoes and destruction of property by earthquakes at the upper end of Lake Managua, of which great use has been made by the friends of the Panama route, proves to have been without the slightest foundation. President Zelaya, of Nicaragua, telegraphed, under date of June 1, to Minister Luis F. Corea that "the news published about recent eruptions of volcanoes and earthquakes in Nicaragua are entirely false." And letters from United States Minister Merry, at San Jose de Costa Rica, recently received, state that there have been no earthquake shocks whatever along the line of the Nicaragua route for the past two months, while there have been several along the line of the Panama Canal. This information is confirmatory of the observations of the Isthmian Canal Commission, that earthquakes are more frequent at Panama than in Nicaragua. That danger from seismic disturbances are no greater at Nicaragua than at Panama may, I submit, be accepted as proved, as far as it is possible to bring proof to bear upon this subject.

The Commission is decided in its opinion that there is no choice between the two routes on account of danger from earthquakes, which, should they occur, would, in its opinion, be likely to inflict little if any damage to a canal. And this view of the matter is strengthened, rather than weakened, by the experience of Martinique and St. Vincent, where a canal situated 16 miles from Mount Pelee or La Soufriere would have met with no serious injury, if, indeed, it received any. Direct injury from an eruption, such as was occasioned at St. Pierre, which is only a few miles distant from the summit of Mount Pelee, is impossible at any point on the line of the Nicaragua Canal, for, as before stated, the nearest volcano is at least 16 miles away. Martinique and St. Vincent leave the canal question just where it was before. There is, therefore, no valid reason for the Commission to change its views on this subject. Whatever danger there might be to a canal in either location is from an earthquake, and, in the opinion of the Commission, there is in this respect no choice in routes.

THE PRAGMATIC CHARACTER OF THE PANAMA SCHEME.

The Panama scheme was conceived in fraud, and fraud has marked every succeeding step in its development. Should the

United States, through misguided action of Congress, purchase what remains of an enterprise which has been a financial and moral curse to France, it will be found that the people of this country have been the latest victims of a swindle of gigantic proportions, whose inception preceded the famous International Canal Congress held in Paris in 1879. I think it is important at this time to go back to the beginning and to show what were the first moves in this great financial game.

After the completion of the Suez Canal its success caused French enthusiasts to turn their attention to that other great need of commerce—a canal to join the Atlantic and Pacific. All schemes proposed were submitted to De Lesseps, and all were encouraged. But it was not until men with prominent names came forward that he gave his sympathy and cooperation. Who these men were, why they proposed the scheme, and how it was adopted by the Paris congress is thus told in a report made in 1880 by W. E. Johnston, delegate of the American Geographical Society to that congress:

These men were Messrs. Wyse, Turr, and Bixio. Lieutenant Wyse, of the French navy, is a son of a former English minister at Athens, and his mother was a Princess Bonaparte, of the Roman branch of the family. General Turr is a Hungarian, and married Lieutenant Wyse's second sister. M. Bixio was a brother of the Minister Bixio of the provisional government of 1848. He died of fever on the Isthmus.

These gentlemen, backed by some bankers and personal friends, made their first visit to the Isthmus three years ago and examined one of the Atreco routes. They came back sick, reported unfavorably, and after some months' consultation, in which M. de Lesseps took a large part, it was decided that Lieutenant Wyse should return to the Isthmus and look at the Panama route, with the view of making that the affair on which they were finally to settle and as the affair to which the public in France would be most likely to subscribe.

The survey was made—how imperfectly was afterwards shown in the congress by the abandonment of all the figures, and of even the plan—the party returned to Paris, and last winter the plan of campaign of putting through the Wyse scheme was organized.

An international congress was to be called, so as to give authority to the scheme; M. de Lesseps was to preside at the congress and issue the invitations, and as the President had the right to constitute the congress as he saw fit, enough French members of the right sort were invited to counterbalance any opposition that might manifest itself. So far as Lieutenant Wyse and party were concerned, they sought first to reimburse themselves for the losses already sustained and for which they were responsible to certain bankers and friends, and this they hoped to do by forming a new company which would assume the responsibilities they had incurred.

This was the origin of the famous congress. It was not, as you see, a very high-toned affair, and it is well that it should be so. The object was to get out of an old debt by creating a new one, to be shouldered by some one else. The digging of a Panama canal was a very distant and very problematic affair.

But it turned out that the congress became a very serious and very grave affair. As eminent engineers from foreign countries began to arrive the hope of carrying out the prepared programme diminished. The great satisfaction which was at first manifested at the prospect of having a large and respectable gathering gave place to sad reflections and sad surmises. The arrival of the two eminent American authorities, Messrs. Armes and Menocal, was a death blow to their hopes, and although those two gentlemen were treated with the greatest consideration, it was felt by the leaders that their coming was a disaster and that a new base of operations would have to be adopted.

There is nothing, in fact, more curious in the history of canals than the evolutions of this congress.

Not only was the president of the congress named in advance, but so also were the officers and the committees, and even the work the committees were to perform. Nothing, it was intended, was to be left to hazard. At the first meeting, at which were present the 136 members and above 30 spectators interested in the subject, nothing was done or allowed to be done but the reading of the names of the members, the names of the committees and their presidents, and an indication of the work they were to do.

The first meeting did not last an hour. No one had a word to say but the president and secretary, and this very summary way of treating the distinct

guished guests who had come a long way to the "study" of the interoceanic canal project was climaxed at the end by the president hastily adjourning the meeting with the remark: "Gentlemen, we are going to rush this thing all American; we shall get through by next Tuesday."

Thus not only was the congress packed and manipulated so as to run through hastily and without fail the imperfect and impossible scheme of parts of the world were invited to give the scheme their aid and to cover it with their responsibility.

It was hardly dignified, therefore, for men holding the high rank of government delegates to take their seat in a congress which had been gotten up for a certain limited and well-defined object, and in which no proposition outside the programme stood the least chance of adoption.

THE CANAL CONGRESS OF 1879.

Mr. Johnston then states that the facts and figures given by Admiral Ammen and Mr. Menocal were a revelation to the congress, which was thereupon compelled to take some serious consideration of the question. During the discussion which followed, one of the delegates, M. Spencet, declared that if De Lesseps's plan of a sea-level canal was impossible, "we must go to Nicaragua." Mr. Johnston then continues:

We were now brought face to face with the singular spectacle of a congress which had become serious and honest, and which saw its way clear to the truth, and yet which was obliged to remain dishonest and carry out the original plan, no matter by what means.

The reason of this singular anomaly is easily understood. M. de Lesseps, Lieutenant Wyse, and the bankers behind them, were pledged to the Panama route, and could not adopt another. That was the French route. They had been long manufacturing enthusiasm for that route. The bankers and the public would not give a cent to any route that was not patronized by M. de Lesseps and Lieutenant Wyse. So that to abandon that route was to abandon entirely for France the glory of cutting the interoceanic canal, and that was not to be thought of for a moment.

They have been claiming, as I have already told you, for years the monopoly of this question; they claimed all the knowledge on the subject, and to lack out now would be to lose all the money they had engaged in the scheme, all the money they expected to gain, which was a mountain, and to lose their popularity besides. The congress would have been dissolved without a decision rather than to have adopted another than the French route.

But how was this accomplished? M. de Lesseps's galloping congress was adjourned for several days. We heard no more of rushing the thing through. They had to stop to change their base. Lieutenant Wyse, with such of the engineers as were pledged to this scheme, went to work in secret committees and labored night and day till they elaborated a new plan to cover, as they thought, the objections of Mr. Menocal, and with, of course, a much higher figure of costs. The committee having in charge the estimates on the probable receipts and expenditures of the canal were instructed by the president to try and make the receipts cover the new estimate of costs, which they did with the greatest ease.

Again the American engineers, backed this time by overwhelming arguments of Sir John Hawkshaw, showed that the plan was still defective; and again the congress was adjourned to give time to the Wyse secret committee to get up new figures and a new plan. The congress, which started off on a gallop, had first dropped into a trot, and was now at a walk. And all to allow Lieutenant Wyse to prepare estimates on difficult details which he had never studied on the ground, and which, therefore, were only theoretical.

The majority of the engineers lost their interest in the proceedings from this moment, and became simple lookers-on, while the meeting relapsed back into its original character of a congress for the benefit of Lieutenant Wyse and his party.

The assembly was now in a crisis. On the one side were the engineers; on the other the business men and the spectators. It looked at one time as if the Congress if called upon would have voted for the plan of Mr. Menocal by Nicaragua. The charter of Mr. Wyse from the Colombian Government exacts the building of the canal by the most economical route, and to build it by the dearest route is a violation and a forfeiture of the charter. But these difficulties, which were pointed out to the Congress, no longer stopped the proceedings. The Wyse party had now offered their ultimatum, which was an open cut without locks and with diversions, or side canals, the whole to cost \$250,000,000 and to pay in receipts \$18,000,000 a year. At this point M. de Lesseps made a long speech.

The effect of this speech was enormous. The American engineers had

shown that the Panama route, principally on account of the annual fall of 12 feet of rain, was impossible; that it never could be finished if commenced, nor made to pay a dividend if finished. It was all to no purpose. Lieutenant Wyse and his committee had but to retire to their consultation room to find at once in their own heads the figures necessary to head off Mr. Menocal's estimates. It was the game of "I see you and go you one better," played by men who had no cards, but plenty of money.

HOW THE BAIT WAS TAKEN.

Mr. SPOONER. What game is that?
Mr. PERKINS. This is the language of the representative from the Geographical and Geological Society at the convention in Paris. It is an enigma to me. I have a slight knowledge of French. His report is made in English. The explanation of the game of cards I leave to some one who has made a study of that branch of science, of which Mr. Johnston was evidently an expert.

Mr. Johnston then describes the plan of voting by which measures were taken to secure a decision in favor of the scheme. The result of this vote was 74 ayes to 62 nays and refusals to vote, out of a total of 136 registered delegates. Commenting on this, Mr. Johnston says:

An analysis of the final vote will show that the able engineers who came to the congress with their minds free from prejudice and with a desire to arrive at the truth are either to be found among the absentees or among those who abstained from voting.

Thus, as the majority for the Wyse scheme was small, as the neutral experts were opposed to it, and as the congress from beginning to end was manipulated in the interest of that scheme, it may be said that, in an international point of view, the decision of the congress was no decision at all and that it is without force and not binding.

A SCHEME TO PAY PRIVATE DEBTS.

Thus was this vast undertaking inaugurated for the purpose of enabling several prominent Frenchmen to pay their debts to French bankers. Its result is well known. A company was organized, and realized from the sale of stocks and bonds \$260,000,000. The items of receipt and expenditure, now a matter of court record, show that there was actually expended by the old company on the Isthmus \$106,400,000.

But after the expenditure of this vast sum on the Isthmus itself, and the dissipation of \$100,000,000 more in various ways with which the promoters of the scheme were doubtless well satisfied, it was found that the actual work of constructing a canal had only really begun.

Mr. McCOMAS. Mr. President—
The PRESIDENT pro tempore. Does the Senator from California yield to the Senator from Maryland?

Mr. PERKINS. Certainly.

Mr. McCOMAS. Was that 156,000,000 francs or dollars?

Mr. PERKINS. I related it to dollars, as we are more familiar with dollars, although all know the commercial value of the French franc. When, therefore, more money was needed, it was not forthcoming, and the company had to go into insolvency. This ended the first step in this stupendous scheme.

A NEW PHASE OF THE SCHEME.

But there were 600,000 or more Frenchmen who had contributed the vast sums that had so rapidly disappeared, and a clamor arose. The only thing to do was to form a new company, raise more money, and, if possible, complete the work. A new company was formed, to which the receiver of the old company, on its behalf, was a party, subscribing thereto, as did also, under compulsion, a considerable number of persons who were charged

with having secured in a manner not too honest a considerable part of the \$260,000,000 contributed by the French people, who were to have 60 per cent of the net profits of the canal. The sum of \$13,000,000 in cash was secured by the new company, principally from those who had been charged with swindling the old one, and work was again begun on the Isthmus in accordance with new plans based on fresh surveys and examination of the ground. With the new company a new survey of the route became necessary, as it had been developed that practically nothing was known of the engineering difficulties.

A technical commission was appointed, composed of the most eminent engineers of Europe and the United States. The sea-level plan was at once abandoned, and surveys made for a canal with locks. It is reasonable to suppose, in view of the exigencies of the case and the absolute necessity for a report assuring construction at a not exorbitant cost, that the difficulties were minimized to the limit of safety under the need of a low cost of construction to induce subscriptions to the enterprise. It is these surveys which our own commission has practically adopted, with the exception of the Bohio Dam, in which case it has made plans which far exceed the limits of safety imposed by the technical commission. For the data obtained under such conditions, I will say parenthetically, the commission advises the United States to pay \$2,000,000. But the difficulties developed proved to be so great that no more funds could be raised, and work had to be stopped. There was here a loss to the subscribers of questionable financial reputation and to bankers who backed them, and it became a question as to how to recoup themselves.

THE UNITED STATES TO BE DRAGGED IN.

Nothing having a chance of success presented itself, except a sale of the whole unsavory mess to the United States. No other scheme has been proposed; no other plan could be devised whereby they could recoup themselves from a financial point of view, except selling this gigantic fraud to the United States. We all know how their offer was reduced from \$109,000,000 to \$40,000,000, and how, in order to secure the latter sum, the rights of the hundreds of thousands of Frenchmen who originally contributed, were sacrificed as far as an expression of willingness to do so can effect that result—not an expression by the people themselves who had put their money into it and who have subscribed to the stock, but by their trusted agents who were engineering the scheme. If the scheme proposed be successful, the suspected swindlers of the old company will get back the money they were compelled to subscribe to the new, and the United States will be brought face to face with half a million or so of Frenchmen who clearly have some rights in the matter, with an undertaking on our hands to complete for \$144,000,000 a work on which the actual expenditure of more than \$156,000,000 has made but a good beginning. This is the Panama scheme, pure and simple, and it means just this: Adopt the Panama route, and, in my opinion, no isthmian canal will be constructed by the United States.

**END OF
TITLE**